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### (54) Navigation device and vehicle comprising the device

Navigationseinrichtung und Auto mit einer derartigen Einrichtung

Dispositif de navigation et voiture munie du dispositif

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(56) References cited:  
**EP-A- 0 346 491** **EP-A- 0 445 719**

#### Remarks:

The file contains technical information submitted  
after the application was filed and not included in this  
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## Description

The invention relates to a navigation device, comprising a memory for the storage of cartographic data, a position sensing unit, a control unit, an input unit, a picture memory and a display unit, the control unit being adapted to navigate a user along a predetermined route on the basis of data from the position sensing unit and the cartographic data, the control unit also being adapted to store in the picture memory cartographic data, selected in dependence on a current position determined by the position sensing unit, for display of a relevant map section via the display unit.

The invention also relates to a vehicle comprising such a navigation device.

A navigation device of the kind set forth is known from European Patent Application 0 306 088 A1. The device described therein is capable of displaying a relevant map section, *via* a display screen, with a name relating to the current route segment, the link between the name displayed and the relevant route segment being emphasized by displaying both items in the same colour. The route itself, determined by entering a starting point and a destination point *via* the input unit, is not displayed.

German Offenlegungsschrift DE 39 05 493 A1 describes a navigation device where a map section around the current position of the user is displayed. The current position is indicated by a dashed circle with an arrow (see Fig. 3). The route, determined by entering all constituent junctions, is displayed as a heavy line (Fig. 3) or a dashed line (Fig. 2). The clarity of such display is far from ideal.

European Patent Application 0 355 232 A2 describes a navigation device in which a map section around the current position of the user is displayed. The predetermined route is displayed as a heavy line (see Fig. 4 or Fig. 16). The current position is displayed as a triangle (Fig. 1 or Fig. 16). The clarity of display is again far from ideal.

EP-A-0 346 491 describes a navigation device as defined in the preamble of claim 1.

For the use of navigation devices in vehicles participating in traffic, it is of essential importance that information presented to the user by the navigation device does not distract the user too long. When information displayed requires an excessive interpretation time, the navigation device will be useless from a point of view of traffic safety.

It is *inter alia* an object of the invention to provide a navigation device which is capable of displaying a relevant map section in such a manner that the situation can be very quickly interpreted by the user. To achieve this, a navigation device in accordance with the invention is characterized as defined in claim 1.

It is advantageous to display the current position in a flashing manner: the clarity is thus enhanced.

The use of two different colours for the representa-

tion of the two route segments also benefits clarity. In this respect, colours are to be understood to include also black, white or a shade of grey (for example, when use is made of a display unit in the form of a monochromatic LCD screen).

A further embodiment of a navigation device in accordance with the invention is characterized in that the picture processing means represent the direction to be followed in conformity with the predetermined route as an arrow which is directed substantially parallel to or coincident with the route. This offers more clarity, notably in the event of a change of direction.

A further embodiment of a navigation device in accordance with the invention is characterized in that the picture processing means represent the route as a double line which is filled up by a first distinct colour for the route segment preceding the current position and by a second distinct colour for the route segment beyond the current position. It has been found that this display, resembling a conventional thermometer, is very user-friendly. Moreover, less severe requirements need then be imposed as regards the distinctiveness of the two distinct colours.

When the double line is represented in the first or in the second distinct colour, there is the advantage that no additional colour is required for the double line.

A further embodiment of a navigation device in accordance with the invention is characterized in that the picture processing means are adapted to represent the current position when it is not situated on the predetermined route, the picture processing means representing the segment travelled and the segment of the predetermined route which has not yet been travelled in a distinct manner. Thus, when a user has left the predetermined route, he can see immediately where he has left the predetermined route, where he is now situated, and how the predetermined route continues.

The invention will be described in detail hereinafter with reference to the accompanying drawings; therein

Fig. 1 shows a navigation device in accordance with the invention, and

Fig. 2A, Fig. 2B and Fig. 3 show examples of displays generated by means of the picture processing means in accordance with the invention.

Fig. 1 shows a navigation device in accordance with the invention. The device comprises a memory M for the storage of cartographic data. This data is to be understood to include: road maps with data relating to the category of roads and intersections, applicable right-of-way rules, speed limits and other traffic rules and prohibitions, street names, traffic signs, road signs, pedestrian crossings, in other words "road furniture", and gas stations, hotels, restaurants and the like ("facilities"), and landmarks. The memory can be fed, for example *via* roadside beacons, *via* a radio link, or with data on a Compact Disc which is capable of storing as much as

4800 Mbits of digital data. The navigation device furthermore comprises a position sensing unit L which continuously determines the position of a user of the device in relation to the road map stored in the memory M. Such a position sensing unit L can be fed with signals from satellites for determining the current position, but may also operate completely autonomously, for example on the basis of measurement values from wheel sensors and a magnetic sensor. Position sensing can also be realised by means of infrared roadside beacons or via a radio communication network. The navigation device furthermore comprises an input unit I for entering an origin and a final destination by the user of the device. The device furthermore comprises a control unit C which is operative to navigate the user along a predetermined route on the basis of data from the position sensing unit L and the cartographic data stored in the memory M. If desired, the control unit C itself can also determine this route on the basis of the origin and final destination entered by the user. Navigating the user implies that the user receives timely instructions as regards changes of direction necessary to follow the predetermined route. Moreover, unclear traffic situations can also be elucidated. This is preferably realised by means of audio instructions (which, therefore, do not visually distract the user), assisted by visual displays such as relevant map sections. This is to be understood to mean a zoomed-in section of the road map stored in the memory M and situated around the current position of the user and his vehicle as determined by the position sensing unit L (redundant information may have been removed from this zoomed-in section), but the relevant map section may also be a stylized representation of the next intersection to be expected. To this end, the control unit C is also operative to store, in a picture memory P, cartographic data selected in dependence on the current position as determined by the position sensing unit L. This selected cartographic data from the memory M represents the surroundings of the current position of the user. These surroundings are maintained fixed per map section or traffic situation to be displayed, and at such a scale that the screen of a customary display unit is suitably filled. The control unit C comprises picture processing means B which, possibly after the generation of a stylized display on the basis of the selected cartographic data or after the removal of redundant information from the selected data, reproduce the predetermined route in a distinct manner in the map section. The content of the picture memory P is displayed via a display unit D. For the display unit use can be made of, for example an LCD screen or a picture tube, the data from the picture memory P then being displayed via a colour look-up table and a digital-to-analog converter. The picture processing means B then reproduce the route segment travelled so as to reach the current position and the route segment to be travelled beyond the current position in a different way. The current position in the constant environment is thus dynamically reproduced per map section

or traffic situation. For a next map section or traffic situation to be displayed, further cartographic data is selected from the memory M so as to display a new environment of the new current position. The new current position is then preferably displayed substantially in the centre of the display, after which the new environment displayed is kept constant again, the changing current position being dynamically displayed within this environment until the environment is no longer relevant to the situation of the user. Subsequently, further cartographic information is selected from the memory M again, etc.

The foregoing is illustrated in the Figs. 2 and 3. Because these Figures are printed in black and white, some aspects of the invention relating to colours have to be separately elucidated. The current position of the user can be reproduced in a flashing manner for those who consider this to be clearer, for example as a yellow, orange or red dot, possibly with a dark edge. The route segment already travelled and the route segment yet to be travelled can be represented by means of a distinct first colour and a distinct second colour, respectively. The choice of the colours used is codetermined by the colours already used in the remainder of the relevant map section reproduced. It is to be noted that colours are also to be understood to include black, white or a shade of grey. In the Figures the route segment already travelled is reproduced in black and the route segment yet to be travelled in white. Evidently, other combinations are also feasible. In Fig. 2A the route in a zoomed-in map section is represented by a double line which is filled up in black for the segment already travelled and in white for the segment yet to be travelled. This method of reproduction (the remainder of the image possibly being coloured) has been found to be very readily interpretable and hence very safe and user-friendly. Adjacent the route to be followed in Fig. 2B the direction is indicated by means of an arrow which extends parallel to the route at the area of the current position of the user. Fig. 3 is a stylized representation of a roundabout where an arrow coincident with the route yet to be travelled points out the way to the user. The route segment already travelled is represented by black rectangles and the route segment yet to be travelled is reproduced in white, the route indication being continuously adapted as the user progresses around the roundabout (the part with black rectangles increases and the white part decreases), in conformity with the current position of the user. At any instant, the user can thus see at a glance where he is situated, where he is coming from and where he is headed. It is to be noted that, generally speaking, clarity benefits when the road segment just travelled or being travelled by the user is reproduced at the bottom of and vertically in the display, in conformity with international conventions regarding traffic signs. The choice of the colours black and white in the Figures, evidently, is not an essential aspect of the invention: any pair of distinct colours is feasible, the use of the double line offers the advantage that less severe requirements

need be imposed as regards the distinctiveness of the two distinct colours (because the double line isolates the colours used from the remainder of the display). When one of the distinct colours is also used as the colour for the double line, no additional colour will be required to reproduce the double line.

When a user in his vehicle deviates from the predetermined route for whatever reason, his current position is reproduced in the display by the picture processing means, for example as a distinct point (flashing or not). The predetermined route will also be reproduced, the segment already travelled and the segment not yet travelled being reproduced in a distinct manner. The user can thus readily see where he is situated, where he has left the route, and how the route continues. He can then decide to go back to the predetermined route, after which the picture processing means, as from the instant that the user follows the route again, reproduce the route and the position again as if the route had been followed. If desired, the picture processing means reproduce in a distinct manner, the route segment followed which deviates from the predetermined route, for example by means of a further distinct colour.

Moreover, like in, for example the vehicle navigation system CARIN, a new route can be determined immediately upon departure from the predetermined route, which new route will act as the predetermined route as from that instant. In that case the route actually travelled is reproduced as the route segment travelled and the (new) further predetermined route as the route segment yet to be travelled, reproduced in a distinct manner in accordance with the invention. The term "predetermined route", therefore, should be dynamically interpreted: the predetermined route can be modified during a trip, both by the navigation device (which is capable of calculating a new optimum route for the user to the destination in the case of a deviation from the previously planned route) as well as by the user himself (who enters another destination or another preferred route *via* the input unit). When a new route has been determined, of course, the control unit and the picture processing means adapt the display thereto. If no new route has been determined, the display is as before: a separate indication of the current position outside the route.

## Claims

1. A navigation device, comprising a memory for the storage of cartographic data, a position sensing unit, a control unit, an input unit, a picture memory and a display unit, the control unit being adapted to navigate a user along a predetermined route on the basis of data from the position sensing unit and the cartographic data, the control unit also being adapted to store repeatedly in the picture memory cartographic data, selected in dependence on a current position determined by the position sensing unit, for

display of a relevant map section *via* the display unit, wherein the control unit comprises picture processing means for displaying, *via* the display unit, the predetermined route in a distinct manner within the map section, the picture processing means representing the route segment travelled to reach said current position and the route segment to be travelled beyond said current position in a different manner, characterized in that only a local environment of the current vehicle position is displayed, inclusive of local road intersection patterns and in-map route indicator signs.

2. A navigation device as claimed in Claim 1, characterized in that the picture processing means represent said current position in a flashing manner.
3. A navigation device as claimed in any one of the Claims 1 or 2, characterized in that the picture processing means represent the direction to be followed in conformity with the predetermined route as an arrow which extends substantially parallel to or is coincident with the route.
4. A navigation device as claimed in any one of the Claims 1, 2, or 3, characterized in that the picture processing means represent the route as a double line wherebetween a first distinct colour is displayed for the route segment travelled preceding the current position and a second distinct colour for the route segment to be travelled beyond the current position.
5. A navigation device as claimed in Claim 4, characterized in that the picture processing means represent the double line in the first or in the second distinct colour.
6. A navigation device as claimed in any one of the Claims 1 to 5, characterized in that the picture processing means are adapted to represent the current position when the latter is not situated along the predetermined route, the picture processing means then representing the segment travelled and the segment not travelled of the predetermined route in a different manner.
7. A vehicle comprising a navigation device as claimed in Claims 1 to 6.

## Patentansprüche

1. Navigationsvorrichtung mit einem Speicher zur Speicherung kartographischer Daten, einer Positionsaufnehmereinheit, einer Steuerungseinheit, einer Eingabeeinheit, einem Bildspeicher und einer Display-Einheit, wobei die Steuerungseinheit ein-

gerichtet ist, einen Benutzer entlang einer zuvor bestimmten Route auf Basis von von der Positionsaufnehmereinheit erhaltenen Daten und den kartographischen Daten zu dirigieren, wobei die Steuerungseinheit auch eingerichtet ist, zur Wiedergabe eines relevanten Kartenabschnittes mittels der Display-Einheit in dem Bildspeicher wiederholt kartographische Daten zu speichern, die in Abhängigkeit von einer von der Positionsaufnehmereinheit bestimmten aktuellen Position selektiert worden sind, wobei die Steuerungseinheit Bildverarbeitungsmittel umfaßt, um mittels der Display-Einheit die zuvor bestimmte Route in deutlicher Weise in dem Kartenabschnitt wiederzugeben, wobei die Bildverarbeitungsmittel das zum Erreichen der genannten aktuellen Position durchfahrene Routensegment und das über die genannte aktuelle Position hinaus zu durchfahrende Routensegment in unterschiedlicher Weise darstellen, dadurch gekennzeichnet, daß nur eine lokale Umgebung der aktuellen Fahrzeugposition wiedergegeben wird, einschließlich lokaler Straßenkreuzungsstrukturen und Routenandeutungszeichen in der Karte.

2. Navigationsvorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Bildverarbeitungsmittel die genannte aktuelle Position blinkend darstellen.
3. Navigationsvorrichtung nach einem der Ansprüche 1 oder 2, dadurch gekennzeichnet, daß die Bildverarbeitungsmittel die zu folgende Richtung entsprechend der zuvor bestimmten Route als Pfeil darstellen, der nahezu parallel zu der Route verläuft oder mit ihr zusammenfällt.
4. Navigationsvorrichtung nach einem der Ansprüche 1, 2 oder 3, dadurch gekennzeichnet, daß die Bildverarbeitungsmittel die Route als doppelte Linie darstellen, wobei zwischen den Linien eine erste deutliche Farbe für das der aktuellen Position vorangehende durchfahrene Routensegment und eine zweite deutliche Farbe für das über die aktuelle Position hinaus zu durchfahrende Routensegment wiedergegeben wird.
5. Navigationsvorrichtung nach Anspruch 4, dadurch gekennzeichnet, daß die Bildverarbeitungsmittel die doppelte Linie in der ersten oder in der zweiten deutlichen Farbe darstellen.
6. Navigationsvorrichtung nach einem der Ansprüche 1 bis 5, dadurch gekennzeichnet, daß die Bildverarbeitungsmittel eingerichtet sind, die aktuelle Position darzustellen, wenn letztere nicht auf der zuvor bestimmten Route liegt, wobei die Bildverarbeitungsmittel dann das durchfahrene Segment und das nicht durchfahrene Segment der zuvor bestimmten Route in unterschiedlicher Weise darstel-

len.

7. Fahrzeug mit einer Navigationsvorrichtung nach den Ansprüchen 1 bis 6.

## Revendications

1. Dispositif de navigation, comprenant une mémoire pour le stockage des données cartographiques, une unité de détection de position, une unité de commande, une unité d'entrée, une mémoire d'image et une unité de visualisation, l'unité de commande étant à même de diriger un utilisateur le long d'un itinéraire prédéterminé sur la base de données provenant de l'unité de détection de position et des données cartographiques, l'unité de commande étant également à même de stocker de façon répétée dans la mémoire d'image des données cartographiques sélectionnées en fonction d'une position présente déterminée par l'unité de détection de position en vue de la visualisation d'une section de carte pertinente via l'unité de visualisation, dans lequel l'unité de commande comprend des moyens de traitement d'images pour la visualisation, via l'unité de visualisation, de l'itinéraire prédéterminé de manière distincte dans les limites de la section de carte, les moyens de traitement d'images représentant de manière différente le segment d'itinéraire parcouru pour atteindre ladite position présente et le segment d'itinéraire à parcourir au-delà de ladite position présente, caractérisé en ce que seul un environnement local de la position présente du véhicule est visualisé, y compris les types de carrefours routiers locaux et les signes indiquant l'itinéraire à suivre sur la carte.
2. Dispositif de navigation suivant la revendication 1, caractérisé en ce que les moyens de traitement d'images représentent ladite position présente d'une manière clignotante.
3. Dispositif de navigation suivant l'une ou l'autre des revendications 1 ou 2, caractérisé en ce que les moyens de traitement d'images représentent la direction à suivre conformément à l'itinéraire prédéterminé par une flèche qui s'étend essentiellement parallèlement à l'itinéraire ou qui coïncide avec celui-ci.
4. Dispositif de navigation suivant l'une ou l'autre des revendications 1, 2 ou 3, caractérisé en ce que les moyens de traitement d'images représentent l'itinéraire sous la forme de deux lignes entre lesquelles une première couleur distincte est visualisée pour le segment d'itinéraire parcouru précédant la position présente et une seconde couleur distincte est visualisée pour le segment d'itinéraire à parcourir

au-delà de la position présente.

5. Dispositif de navigation suivant la revendication 4, caractérisé en ce que les moyens de traitement d'images représentent les deux lignes dans la première ou dans la seconde couleur distincte. 5
6. Dispositif de navigation suivant l'une quelconque des revendications 1 à 5, caractérisé en ce que les moyens de traitement d'images sont à même de représenter la position présente lorsque celle-ci n'est pas située le long de l'itinéraire prédéterminé, les moyens de traitement d'images représentant alors le segment parcouru et le segment non parcouru de l'itinéraire prédéterminé de manière différente. 10 15
7. Véhicule muni du dispositif de navigation suivant les revendications 1 à 6. 20

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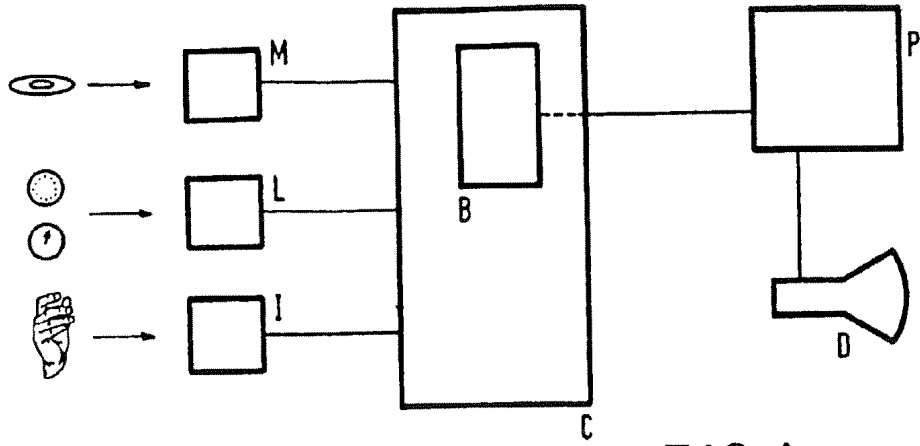


FIG. 1

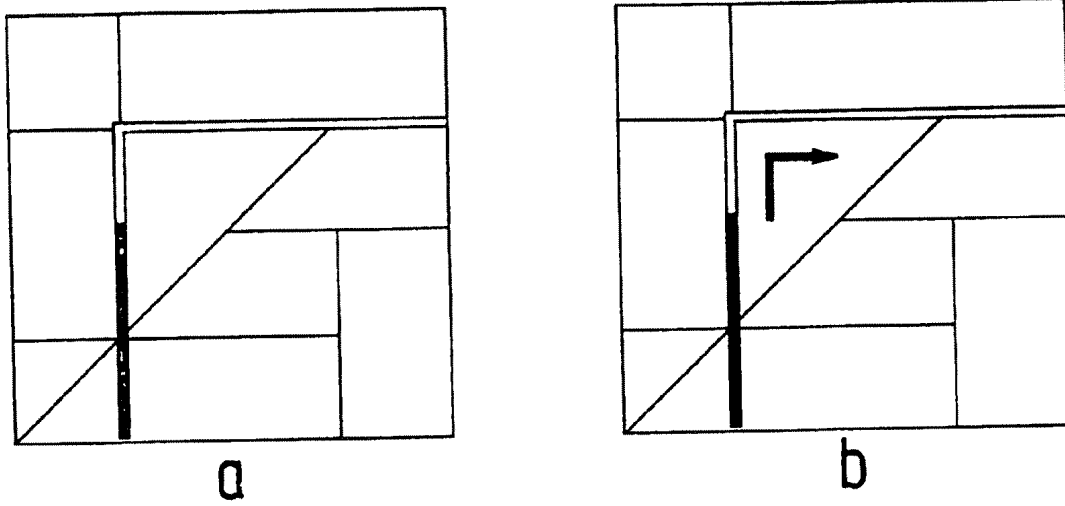


FIG. 2

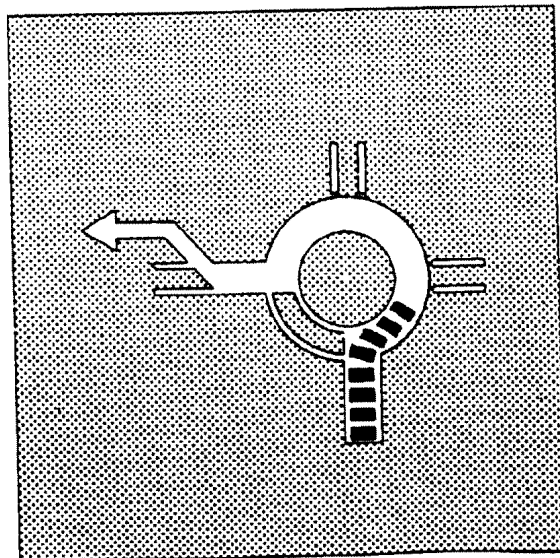


FIG. 3